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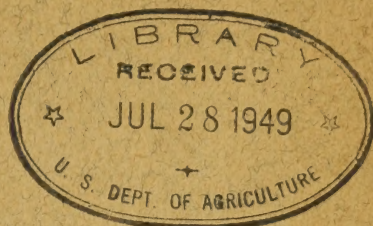
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FRANK D. GARDNER, Special Agent in Charge,
Mayagüez, September, 1902.

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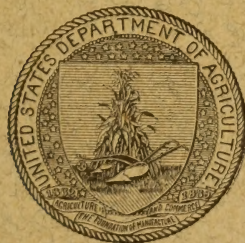


THE AGRICULTURAL EXPERIMENT STATION OF PORTO RICO; ITS
ESTABLISHMENT, LOCATION, AND PURPOSE.

BY

FRANK D. GARDNER.

UNDER THE SUPERVISION OF
OFFICE OF EXPERIMENT STATIONS,
U. S. DEPARTMENT OF AGRICULTURE.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1903.

PORTO RICO AGRICULTURAL[®] EXPERIMENT STATION,

FRANK D. GARDNER, Special Agent in Charge,

Mayagüez, September, 1902.

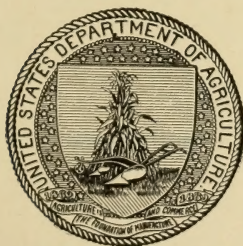
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**PORTO RICO AGRICULTURAL EXPERIMENT STATION, MAYAGÜEZ,
PORTO RICO.**

[Under the supervision of A. C. True, Director of the Office of Experiment Stations
United States Department of Agriculture.]

STATION STAFF.

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PAUL A. ENGLISH, *Assistant Agriculturist.*

C. R. NEWTON, *Clerk and Stenographer.*

Withdrawn

8/12/48

LETTER OF TRANSMITTAL.

MAYAGÜEZ, PORTO RICO, *September 10, 1902.*

SIR: I have the honor to transmit herewith a bulletin in which is given an account of the establishment of the agricultural experiment station in Porto Rico under the auspices of the Office of Experiment Stations, United States Department of Agriculture. The present location and equipment of the station are described, the contemplated work outlined to some degree, and the purpose of the station defined. I respectfully request its publication as Bulletin No. 1, of the Porto Rico Agricultural Experiment Station.

Very respectfully,

FRANK D. GARDNER,
Special Agent in Charge.

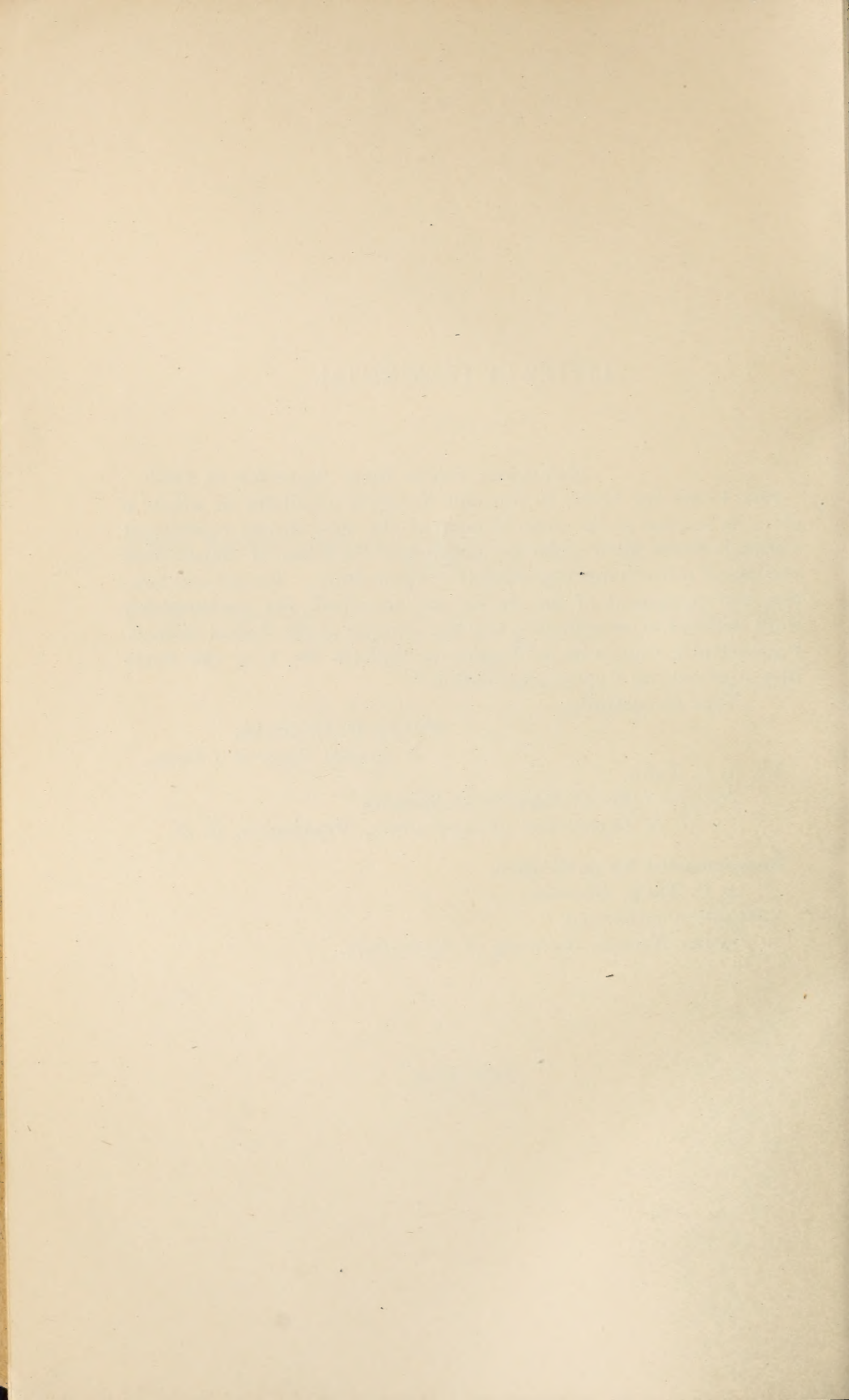
Dr. A. C. TRUE,
*Director Office of Experiment Stations,
U. S. Department of Agriculture, Washington, D. C.*

Recommended for publication.

A. C. TRUE, *Director.*

Publication authorized.

JAMES WILSON, *Secretary of Agriculture.*



CONTENTS.

	Page.
Introduction	7
Description of farm	9
Equipment	10
Investigations undertaken	10
Soil survey	12
Contemplated experiments	12
Cooperation	12
Object of station	12

ILLUSTRATIONS.

	Page.
PLATE I. Location of Porto Rico Agricultural Experiment Station.....	8
II. Fig. 1.—River bottom land and part of Mayagüez as seen from the station residence. Fig. 2.—Bottom land, principal buildings, and upland beyond as seen from Añasco Road Bridge at the River Yagüez.....	8
III. Fig. 1.—Native vegetation on station farm. Fig. 2.—Thatched sheds for shading coffee-seed beds at “La Carmelita,” where experimental work with coffee is conducted.....	8
IV. Fig. 1.—Experiment station residence. Fig. 2.—Office, laboratory, and storage quarters of the station	8

THE AGRICULTURAL EXPERIMENT STATION OF PORTO RICO; ITS ESTABLISHMENT, LOCATION, AND PURPOSE.

INTRODUCTION.

The first appropriation made by the United States Congress for agricultural investigation in the island of Porto Rico was for the fiscal year ended June 30, 1901. The amount of this appropriation was five thousand (\$5,000) dollars, and authorized the Secretary of Agriculture to make preliminary investigations as to the agricultural conditions of the island, with especial reference to the establishment and maintenance of an agricultural experiment station. The investigations called for under this appropriation were made through the Office of Experiment Stations, by Prof. S. A. Knapp, formerly of Iowa Agricultural College, and more recently engaged in agricultural investigations in the State of Louisiana. Professor Knapp visited the island during the summer of 1900, and presented his report in September of the same year. This report was transmitted to Congress, and published as House Document No. 171 (Fifty-sixth Congress, second session). It gives a summarized statement of the results of Professor Knapp's investigations, in which he points out the needs for the establishment of the experiment station, the more important subjects on which the people required immediate information, and how, in his opinion, it could best be supplied.

As a result of this report, Congress made a second appropriation of \$12,000 for the fiscal year ended June 30, 1902, which authorized the Secretary of Agriculture to establish and maintain an experiment station in this island, and to erect necessary buildings and provide for printing of bulletins, circulars, etc. Although the appropriation did not become available until July 1, 1901, the writer, then an assistant in the Division of Soils in the Department of Agriculture at Washington, was transferred to the Office of Experiment Stations during the month of April, and appointed to take charge of the investigations in Porto Rico. He arrived in San Juan about the middle of May, and spent the remainder of the fiscal year in traveling about the island, familiarizing himself with the agricultural conditions and needs of the people with especial reference to the location and establishment

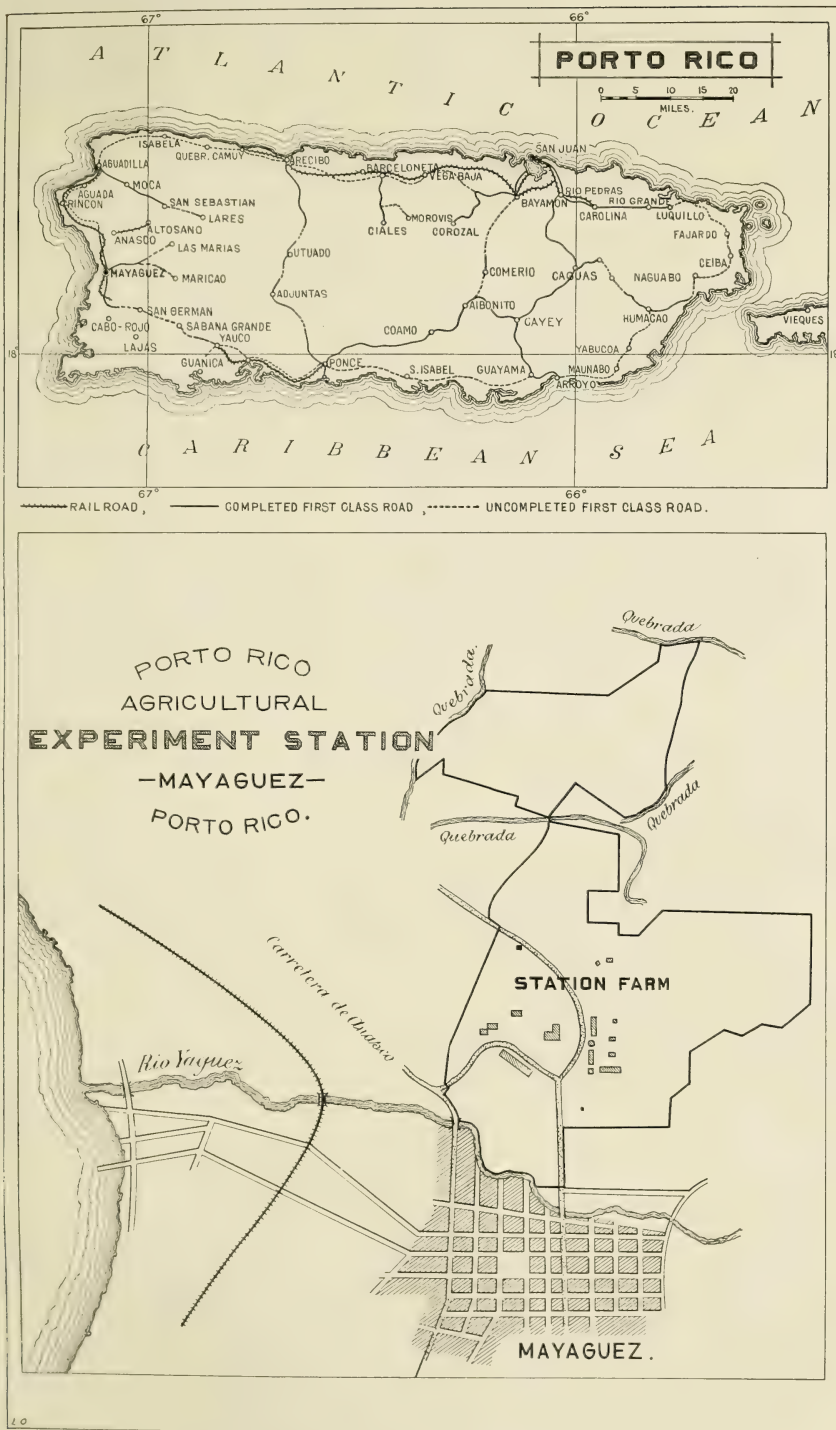
of the experiment station. A brief report of these preliminary investigations may be found in the report of the Director of the Office of Experiment Stations for the year 1901, pages 211 to 214, inclusive. As soon as the appropriation became available, July 1, 1901, he endeavored to secure, through the people of the island, suitable land on which to establish the station. It was found, however, that the land suitable in extent, character, and location for the purpose could not be procured without a considerable outlay of money.

The legislature having adjourned at the close of the February preceding, no assistance could be secured from that source until it again convened, which was in January, 1902. Efforts were, therefore, made to secure the necessary assistance from some of the larger municipalities, but it was found that none of them possessed lands suitable for this purpose, nor were their financial conditions such as to justify their attempting to purchase land for the purpose. It was, therefore, decided to lease a small tract of land and a building suitable for office purposes as a means of carrying out on a temporary basis the experimental work. This resulted in the leasing of land and a building at Rio Piedras.

Active operations were commenced in clearing and breaking land early in November, and about one hundred varieties of crops, mostly annuals, were planted. Some were planted at monthly intervals, with the hope of ascertaining the best season in which to plant, others with reference to treatment with different fertilizers in order to ascertain the needs of the soils and the kind and amounts of different fertilizers best suited to meet these needs; others being entirely new to the country were planted to see how they would succeed.

The climatic conditions were abnormal during the first five months. Insect enemies as well as fungus and bacterial diseases were very bad, injuring nearly all classes of the crops. As a result of these unfavorable conditions, and the impoverished condition of the soil, many of the experiments had a negative value. The results of others will be published by the station in its forthcoming bulletins. Briefly, the important factors brought out were the impoverished condition of the soil and the need of fertilizer with which to meet it, and the need of devising means of combating both insects and plant diseases. Work was immediately begun along the latter line, special attention being given to the changa, and enough information concerning this insect has been collected to justify the publication of a report which is issued as Bulletin No. 2 of this station.

The experiments at Rio Piedras were of a temporary nature, for the reason that a permanent location was expected to be secured at an early date. The needs for such a location were presented to the insular legislature in February, and a bill, making immediately available \$15,000 for the purchase of a suitable tract of



LOCATION OF PORTO RICO AGRICULTURAL EXPERIMENT STATION.



FIG. 1.—RIVER BOTTOM LAND AND PART OF MAYAGÜEZ AS SEEN FROM THE STATION RESIDENCE.



FIG. 2.—BOTTOM LAND, PRINCIPAL BUILDINGS, AND UPLAND BEYOND AS SEEN FROM AÑASCO ROAD BRIDGE AT THE RIVER YAGÜEZ.





FIG. 1.—NATIVE VEGETATION ON STATION FARM.



FIG. 2.—THATCHED SHEDS FOR SHADING COFFEE SEED BEDS AT "LA CARMELITA,"
WHERE EXPERIMENTAL WORK WITH COFFEE IS CONDUCTED.



FIG. 1.—EXPERIMENT STATION RESIDENCE.

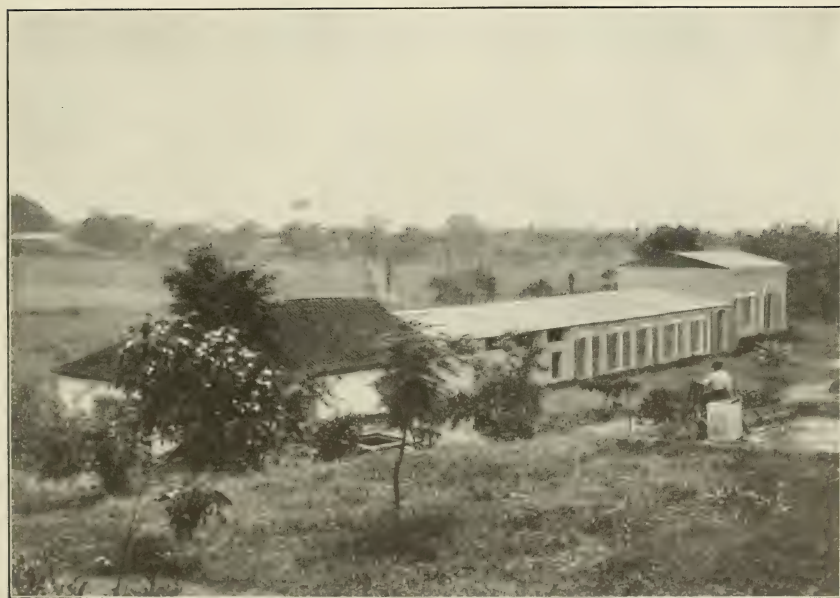


FIG. 2.—OFFICE, LABORATORY, AND STORAGE QUARTERS OF THE STATION.

land for the use of the agricultural experiment station passed both houses with very little opposition. Bids were called for in March, which were to be opened May 12. On the latter date, Dr. Walter H. Evans, of the Office of Experiment Stations, who had been authorized by the Secretary of Agriculture to proceed to Porto Rico and act with the representative in charge of the station, conferred with the governor and the secretary of the interior of the island, with reference to selecting a site as offered by the bids.

Twenty-three proposals were received in proper form, and the tracts that were obviously best were visited and examined with reference to their suitability for the purpose, the result being the selection of a site adjacent to the city of Mayagüez. This proposal had been submitted by the city itself, which had secured an option on a tract of land for \$19,000, the excess over the appropriation to be paid by the city. Possession of the land was given the last week in June, and the experiment station removed from Rio Piedras to its new site the first week in September.

DESCRIPTION OF FARM.

The farm, formerly known as "La Carmen," is located near the city of Mayagüez. A portion of the river-bottom land borders the river Yagüez and the main road to Añasco. The map, Plate I, shows its form and location with reference to city and the seashore. The land is diversified in character of soil, topography, and exposure. There are about 35 acres of river-bottom land (Pl. II, fig. 1) nearest the city, which contains a loam, to the depth of 3 feet or more. This, at present, is all in "malojilla" grass. The land to the north of this consists of low, rounded hills and intervening valleys and coves (Pl. II, fig. 2), many of which are well sheltered and well watered. In various of the sheltered places coffee is planted, there being, in the aggregate, about 7 acres planted to that crop; the remainder of the land is largely in an unproductive condition, being overgrown with weeds, bushes, and small trees intermingled with a small amount of various kinds of grasses, which would furnish some pasture (Pl. III, fig. 1). Although in an unproductive condition, the place presents very good possibilities, and is well suited to the purpose of the experiment station.

The main residence, an eleven-room frame house, has been put in repair and painted both inside and out, and is occupied as living quarters (Pl. IV, fig. 1). An old masonry sugar building, a large part of which was unroofed and the walls of which were more or less broken and damaged, has been repaired, roofed, and painted, both inside and out, and will serve the present needs of the station for office, laboratory, and working quarters (Pl. IV, fig. 2). There is a brick factory, containing three kilns and several drying sheds; also numerous small huts for the use of the laborers on the farm.

To fully equip the stations with suitable buildings and put the farms in the best condition for effective work, funds in addition to those granted by the National Government will be required, and it is therefore hoped that the insular government will continue its liberal policy toward the station. In the United States, with a few exceptions, the experiment stations are located at the agricultural colleges or the State universities, and therefore are granted the use of lands and buildings which belong to these institutions. Even in the exceptional cases the lands and buildings are provided for by the State funds. Such an arrangement makes all of the Federal appropriation available for experimental purposes. Many of the States are going still further and making appropriations for investigations, some of which exceed those made by the Federal Government.

The present appropriation for the Porto Rico Station for the year ending June 30, 1903, is twelve thousand (\$12,000) dollars, and it is hoped that Congress will soon increase this.

EQUIPMENT.

A fair equipment has already been assembled for the use of the station in the way of work animals, wagons, plows, harrows, and other machinery; also a good supply of small implements such as shovels, forks, hoes, rakes, scythes, machetes, etc. A small amount of apparatus for spraying purposes and for the pruning of trees has been secured; also various chemicals and insecticides.

The office is provided with a fair amount of furniture in the way of desks, chairs, and bookcases, together with the smaller furniture which goes with them. A library has been commenced, and about two hundred bound volumes are now on its shelves, with a considerably larger number of unbound publications. An exchange list has been organized with a number of leading agricultural periodicals, not only in the United States, but in foreign countries as well, and upwards of twenty different periodicals are now on the files of the station. A collection of economic plants and insects has been commenced under the direction of the entomologist and botanist.

With sufficient means at our command, it is only a matter of time when this equipment can be made a most valuable one to the people of Porto Rico.

The clearing of a portion of the land for the planting of crops has been commenced and plants and seeds of different kinds are being secured, not only from different sources at home, but also from foreign countries and neighboring islands.

INVESTIGATIONS UNDERTAKEN.

In addition to the above-mentioned experiments with vegetables and annual crops at Rio Piedras, work was commenced in September,

1901, with coffee. A good supply of seed coffee was secured in the "barrio" of Mameyes, district of Utuado, and by selection of the best berries from the sturdiest and best-developed trees from various plantations. These were pulped and specially prepared for seed. In December seed beds were prepared in which to plant the seed, by thoroughly plowing and pulverizing the soil, then elevating it into beds 3 by 15 feet in area, and covering each similar to those in use at "La Carmelita" with a grass shed (Pl. IV, fig. 2.) Each bed was surrounded by a board frame in order to keep the sides from caving, and provided with shelters for the purpose of keeping off the direct sunlight and preventing the washing of the soil by heavy rains. During the month of January the seeds were planted in the beds, 2 inches apart each way, there being approximately 1,600 seeds in each bed, the total number of beds being twenty. In from six to seven weeks the seeds germinated, and resulted, a few weeks later, in a good stand of healthy plants. Eighty additional beds similar in every respect to those planted, also provided with straw roofs, were then constructed for nursery beds. When the small plants had fully developed their second pair of leaves they were transferred from the seed beds to the nursery beds, in order to give them more room to develop. During this transferring process another selection was made by rejecting all inferior plants, or those having poorly developed root system. In the nursery beds the plants were set 6 by 6 inches apart, there being one hundred beds. Fertilizers of different kinds and in different amounts were applied to these in order to accelerate growth as well as to ascertain the kind of fertilizer best suited to this purpose.

Arrangements have been made to carry on experiments with reference to the improvement of an old coffee grove on the estate known as "La Carmelita," situated about eight miles north of Ponce, operated by the "La Carmelita" Company. Ten acres have been divided into as many plats, from which the present crop will be harvested and the yield of each plat ascertained. After the crop has been gathered each plat will be treated in a different way, some being thinned and pruned, others having the plants cut off a few inches above the ground in order to obtain a new growth; some will be given cultivation, while others will have the shade reduced, etc.

The use of 25 acres of virgin forest land has also been arranged for, and a part of the land will be cleared and planted with the new plants from the nursery. Different varieties of coffee are also being secured from different coffee-producing countries, in order to find out what varieties may be best suited to the conditions of Porto Rico, as well as to give an opportunity for crossbreeding, budding, etc., which will be important factors in coffee improvement.

SOIL SURVEY.

During the months of January, February, and March, 1902, a soil survey was conducted in cooperation with the Bureau of Soils of the Department of Agriculture at Washington. The experts for this work were furnished by the Department, and a part of the field expense was borne by the experiment station. The survey includes an area of approximately 360 square miles, or a strip 10 miles wide extending from the north shore at Arecibo to the southern shore at Ponce. It includes a mapping of the roads, trails, and streams as a basis on which to map the soils, for no accurate surveys of the area had previously been made; a classification of the soils and mapping of each type; a study of the agricultural practices and possibilities, together with the best adaptation of each type to crops. Typical samples of soil and subsoil were taken from each type for physical and chemical study in the laboratory. The maps are to be published on a scale of one inch to the mile. The work has been completed, and the maps and manuscript resulting therefrom are now ready for the printer. The work will be published by the Department at Washington, and it is desired to have a translation of the manuscript prepared by the experiment station, to be issued at the same time for distribution here in conjunction with an additional supply of maps which may be secured through the Department.

CONTEMPLATED EXPERIMENTS.

In addition to the above-mentioned experiments, most of which will be continued, it is the purpose of the station to give prominence to the production of various classes of tropical fruits. Arrangements have already been made for securing different varieties of these from various sources. Nurseries of citrus fruits, mangoes, aguacates, and many other kinds will be started as soon as possible. It is the intention to attempt the improvement of the varieties of fruits now being grown here, through cultivation, crossbreeding, grafting, and whatever methods give promise of good results.

Thus far no live stock for experimental purposes have been secured, but when sufficient means are available, experiments will be commenced with cattle, horses, swine, sheep, and poultry, and work will also be undertaken in reference to the production of dairy products. Experiments will also be inaugurated in reference to the production of tobacco, which is one of the staple crops of the island.

COOPERATION.

The station desires to cooperate with a limited number of representative agriculturists in different parts of the island. Cooperative experiments create an interest in the immediate neighborhood where

they are conducted, and furnish an object lesson for the people of the locality. Many field and garden seeds have been sent to the planters of the island, the supply having been secured through the Department of Agriculture at Washington. An important point in this connection is that most seeds, when kept in this climate for a few months, lose their vitality and become worthless. It is well, therefore, in securing seeds to get them fresh and plant very soon thereafter.

When the coffee trees from the above-mentioned nursery beds are ready for planting in the fields, it is the desire of the station to send, without cost, to a number of representative coffee planters in different parts of the island, enough trees for the planting of small blocks, to be set and cared for according to directions which will be furnished by the experiment station.

OBJECT OF STATION.

The object of the station is to make a systematic study of all problems related to agriculture with a view to acquiring information which will be of practical use to the agriculturists of the island.

While scientific investigation will always form a part of the station work, yet much attention will be given to the practical side of the work. Experiments in the fields to ascertain the feasibility of untried methods and to test and demonstrate the advisability of introducing new crops or new practices will form important lines of work. It will be the policy of the station to confine most of its energy to a few well-directed lines of investigation which seem of most importance to the agriculturists of the island. When, through trial, new and valuable crops are secured, it will be the object of the station to distribute them or to put the planters in the way of securing them.

As a rule, agricultural investigations are too costly for the individual to undertake. They also require training and oftentimes special and expensive apparatus which the farmer usually does not possess. In recent years, therefore, experiment stations have been established in nearly all countries and men are employed who are fitted by special training to carry on the various lines of work for which there is a demand. Practical conclusions having been drawn from investigations, it is essential that they should be presented to the people in such form as to be clearly and easily comprehended, and this the station will attempt to do by means of bulletins, reports, correspondence, and personal advice.

The members of the staff recognize that their reputation depends upon how useful they make the work of the station to the people of Porto Rico, and it shall be their constant endeavor to work for the uplifting of the agriculture of the island with all the ability and means at their disposal. In order to be successful, however, it will require more than the most earnest endeavors of the station officials; it will

need in addition the interest, cooperation, and hearty support of the agricultural people of the island. The results of the work of the station, as far as it permits the drawing of practical conclusions, will be published from time to time, as bulletins or circulars for free distribution to the people. We hope the demand for them will be great; that they will be extensively read, and that the suggestions contained in them will be put into practice by the people. The measure of the derived benefits will depend largely upon this practical application of results.

A mailing list for the distribution of station publications has been begun, and everyone interested in the work of the station is invited to send in his name, requesting that it be placed upon the list for the publications as issued.

Correspondence on subjects relating to the work of the station or the conditions and requirements of any phase of the island agriculture is invited and visitors will always be gladly welcomed. Conferences with farmers will also be encouraged.

LIST OF PUBLICATIONS OF THE U. S. DEPARTMENT OF AGRICULTURE RELATING TO PORTO RICO.

FOR GRATUITOUS DISTRIBUTION.

[Requests for these publications should be sent to the Secretary of Agriculture or to a Senator or Representative or Delegate in Congress.]

Agricultural Resources and Capabilities of Porto Rico. By S. A. Knapp. Pp. 32. 56 Cong., 2d sess. House Doc. 171.

Agriculture in Porto Rico. By Roy Stone. Pp. 505-514. Reprinted from Year-book of Department of Agriculture for 1898.

Notes on the Animal Industry of Porto Rico. By O. F. Cook. Pp. 663-667. Reprinted from Sixteenth Annual Report, 1899, Bureau of Animal Industry.

Annual Report of the Porto Rico Agricultural Experiment Station, 1901. By F. D. Gardner. Pp. 381-415. Reprinted from Annual Report of the Office of Experiment Stations for the Year ended June 30, 1901.

The Dairy Industry and Dairy Markets of Porto Rico. By R. A. Pearson. Pp. 306-397. Reprinted from Eighteenth Annual Report, 1901, Bureau of Animal Industry.

FOR SALE.

[To secure these publications, address the Superintendent of Documents, Union Building, Washington, D. C., inclosing price given. Remittances must be made by cash or United States postal order. Postage stamps and checks not accepted.]

Trade of Porto Rico. By F. H. Hitchcock. Pp. 84. Foreign Markets Bul. No. 13. Price 5 cents.

Hurricanes: Especially those of Porto Rico and St. Kitts. By Wm. H. Alexander. Weather Bureau Bul. No. 32. Pp. 79. Price 15 cents.

The Mango in Porto Rico. By Guy N. Collins. Bureau of Plant Industry Bul. No. 28. Pp. 33. Price 20 cents.

^a Notes on Forest Conditions of Porto Rico. By Robt. T. Hill. Bureau of Forestry Bul. No. 25. Pp. 48. Price 10 cents.

^a Not available for distribution.

